GPG390 | Good Practice Guide

# Saving energy at leisure

CARBON TRUST

Making business sense of climate change

# Contents



# Inserts




Front cover photo courtesy of Simon Doling/Feilden Clegg Bradley Architects

# Saving energy at leisure

Using this Guide could help your leisure centre save **money** and **energy**, and reduce the **environmental impact** of its operation, through better energy management.

Just by making a 10% improvement in the management of energy use, UK leisure facilities could save up to £70M each year and reduce greenhouse gas (carbon) emissions by hundreds of thousands of tonnes.

Carbon dioxide ($CO_2$) and other pollutants are emitted to the atmosphere from boilers and from the power stations that generate electricity used in leisure centres. Saving energy decreases these emissions, reducing acid rain and air pollution and helping to tackle Global Climate Change.

Every leisure facility can save energy but to be successful, a holistic approach is required. To make the most of saving opportunities throughout your building(s), it is important to try and follow the guidance in this document.

Although labelling light switches and raising awareness may provide short term gains, it is unlikely to bring about permanent savings unless this is incorporated into a longer term strategy for managing energy. Each person or employee can play their part; by including everyone, it creates a sense of ownership which has been shown to improve results. It is also an excellent opportunity to translate global concerns into local action. The raised awareness of using finite resources will be taken home and into future workplaces.

Managing energy will result in achieving organisational objectives at minimum cost by:

1. Purchasing energy as cheaply as possible and procuring a green supply if appropriate.
2. Minimising consumption whilst ensuring standards of comfort and service are maintained or improved. This is the focus of this document.

A number of technologies and techniques are available to improve the energy efficiency of most types of indoor sports facilities. Many are simple low cost measures and good housekeeping improvements with short payback periods.

Energy management can be successful if:

- It is recognised that all staff and users have a contribution to make. It is unlikely that there will be an energy expert at the centre so working together will ensure that no individual is overloaded
- The process matches the skills and abilities available to the required roles and activities
- Staff are supported throughout the process of energy saving and receive regular feedback on savings achieved
- Organisations share lessons learned and experiences between their centres
- Staff and users are empowered to be proactive in promoting the wise use of energy. By focusing on the human aspect of managing energy, significant savings can be achieved

"I'm very impressed with the savings that have been made at our centre. By getting everyone involved, we really have started to make considerable inroads into our energy costs."

Steve Hodges, North Somerset Council

- Specialists are called upon to provide support on technical issues, where appropriate
- Routine maintenance is carried out regularly as maintenance offers a cost effective opportunity to improve energy efficiency.

This guide will help you to identify and implement good housekeeping (no cost measures) and some relatively low cost measures. It will also demonstrate key aspects of managing energy, including how to monitor energy use, identify opportunities and benchmark your consumption.

Though good design of leisure facilities and investment in fabric, equipment and controls are important, they are not the focus of this Guide. Some sections will, however, help you to identify where investment in energy efficiency is necessary or worthwhile.

Routine maintenance also offers a valuable chance to improve energy performance. This guide advises on common maintenance issues which can impact on energy use.

Managing energy not only saves money, it also has the following benefits:

### Improving environmental performance

The UK has signed up to a legally binding target to reduce six greenhouse gases (including Carbon Dioxide or $CO_2$) by 12.5% based on 1990 levels for the period 2008-2012. Furthermore, the UK has committed to a national 20% reduction in $CO_2$ emissions by 2010, as part of its Climate Change Programme.

$CO_2$ is emitted to the atmosphere from boilers, CHP units and the power stations supplying your electricity. So saving energy reduces carbon emissions whilst also reducing acid rain and air pollution associated with power stations.

As UK targets become increasingly stringent, reducing emissions will become more and more important. The leisure sector is an intensive energy user and has a major part to play in this respect.

### Improving comfort conditions

Saving energy can often improve comfort conditions for both staff and centre users (e.g. elimination of draughts, moisture and overheating), which can improve morale and productivity.

### Reducing other costs

Saving energy reduces maintenance costs. Operating energy-consuming equipment more efficiently can increase the useful life of apparatus, resulting in capital replacement costs being deferred. Within wet sports centres can also reduce the risk of damage to the building fabric caused by condensation from overheating of pool water. Energy-saving will help to increase centre profitability and job security too.

Did you know that sports and leisure facilities release over ten million tonnes of $CO_2$ each year? That's enough to fill nearly two million hot air balloons!

# The Energy Team

## Who should be on the team?

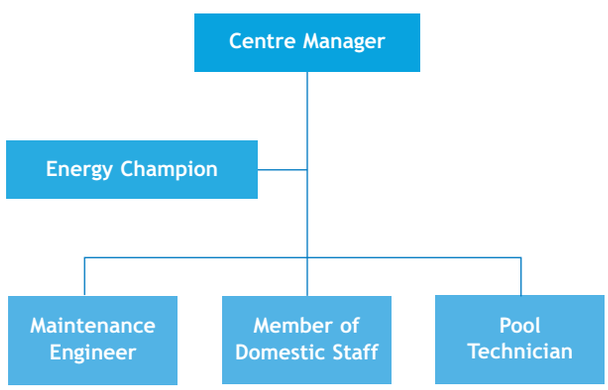
It is important to assemble a team with a mix of skills and responsibilities. Try to get a good representation of staff including senior management, maintenance personnel, catering, cleaning and service staff. The better the mix of team members, the more likely it is that all their colleagues will respond positively. It should also minimise the chances of the team agreeing inappropriate actions which could undermine future activities.

An example Energy Team (Figure 1) might comprise of:

- The Centre Manager — will lead energy team meetings, support implementation of the energy efficiency policy and demonstrate high-level commitment to energy saving
- A staff energy champion — an enthusiastic member of staff who will help to promote energy saving initiatives amongst other employees and support the Centre Manager with implementation of the energy policy
- The Centre Maintenance Engineer — will have a vital role to play on the energy team as many energy saving opportunities come from maintenance of plant, refurbishment or the correct setting of controls
- A member of the domestic staff — an important team member, often seen as the 'eyes and ears' of the centre as they can help implement good housekeeping measures such as switching off lights and closing windows and doors to prevent draughts
- The swimming pool technician — in wet leisure centres, the person responsible for the pool is a very important team member as many energy savings result from correct use of the pool plant and associated systems
- Organisation staff — if your centre is part of a larger organisation, there may be a group Energy Manager or similar person that could help with advice and energy facts and figures.

You could also set up an Energy Team for the group with representatives from each centre to share experiences, advice and compare energy and water use.

***Figure 1*** *An example of an energy team*



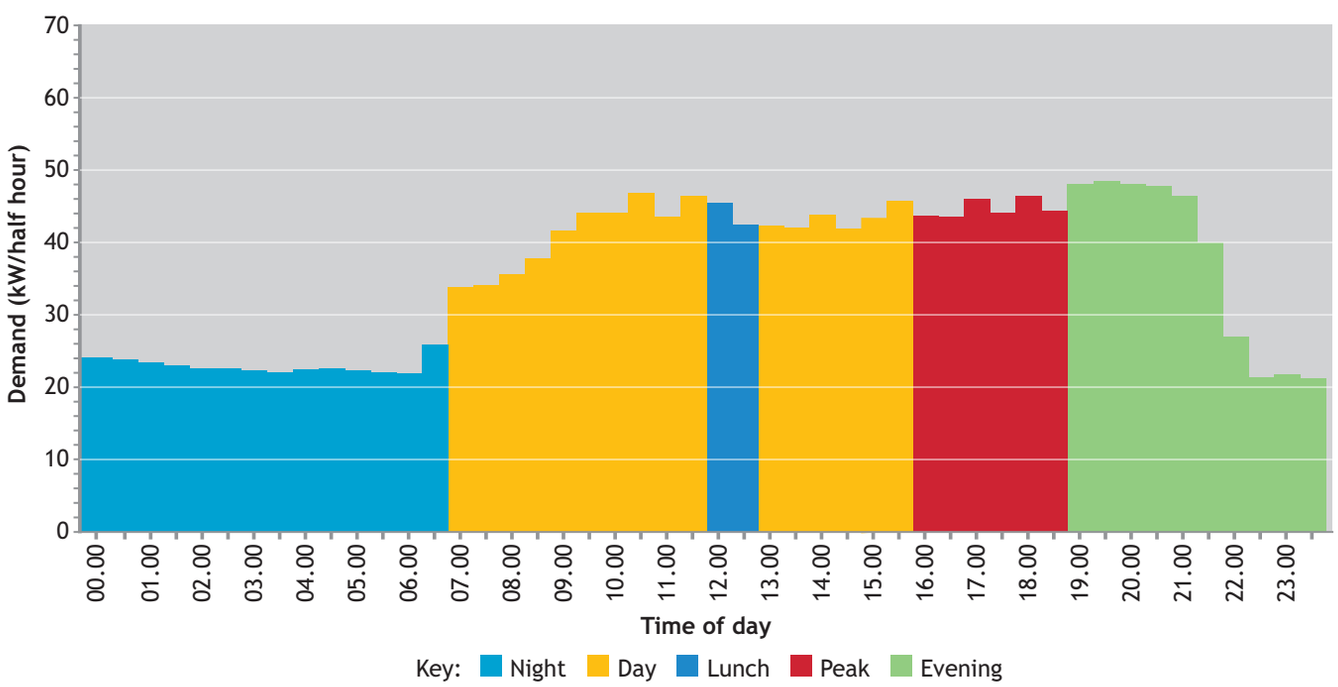
## Saving energy at leisure — Case Study 1

A holistic approach to energy saving in leisure centres managed by Knowsley Metropolitan Borough Council generated impressive results. By using a new real-time energy monitoring system (Figure 2) as well as staff training and awareness raising, the Council saved 24% of electricity and 30% of gas used at the leisure centre sites.

"The new electronic system is a most useful tool, showing consumption data from up to several months at a time on one computer screen. This enables erroneous patterns of usage to be spotted and corrected."

**Barry McKean,**
**Knowsley Metropolitan Borough Council**
Energy Institute Energy Manager of the Year 2004

***Figure 2*** *In depth computerised energy use data helped to generate large savings for Knowsley MBC*



# Policy and action planning

## The Policy

Developing an energy policy forms an essential part of raising the profile of energy efficiency. It should:

- Make a statement of commitment
- Specify clear objectives
- Identify responsibilities and resources
- Set clear targets for energy consumption
- Provide an action plan
- State the mechanisms to implement the action plan
- Highlight the policy review process and link the policy to other organisational policies if they exist.

The policy (Insert 2) should be developed by the energy team, in consultation with staff and interested centre users. Where the site is one of many within an organisation, the local policy must reflect the core values and approach of the parent organisation.

Members of the Energy Team must help to develop and take ownership of the energy policy. It should initially aim to secure commitment from staff and users and provide a one year plan to manage energy in the centre.

An example of a typical energy policy is included as an insert at the back of this document and can be used to structure your own plan. Refer to the energy management matrix inserts to get an idea of your centre's energy management profile (Inserts 4 and 5).

## Action planning

All management processes need a structured approach if they are to be implemented successfully and energy management is no different.

Picture courtesy of Andrew Southall/Feilden Clegg Bradley Architects

# Energy meters and monitoring

## Meters

To manage energy at any leisure facility, it is vital to gather the correct energy data and to follow the correct analysis procedure (Figure 3). Some sites rely on data from energy and water invoices but the only way to obtain reliable data is to read your own meters.

Meters should be read regularly, at least monthly. If you are a high energy user (e.g. a wet sports centre or fitness suite with sauna facilities), you will probably benefit from reading the meters more frequently.

## Benefits of reading your meter:

- Reliable information (instead of estimated readings) is used for regular monitoring
- Waste can be detected quickly and preventative action taken
- Consumption can be compared against benchmarks to determine your potential savings
- Invoicing errors can be quickly identified and rectified
- Feedback can be given to end users on savings achieved.

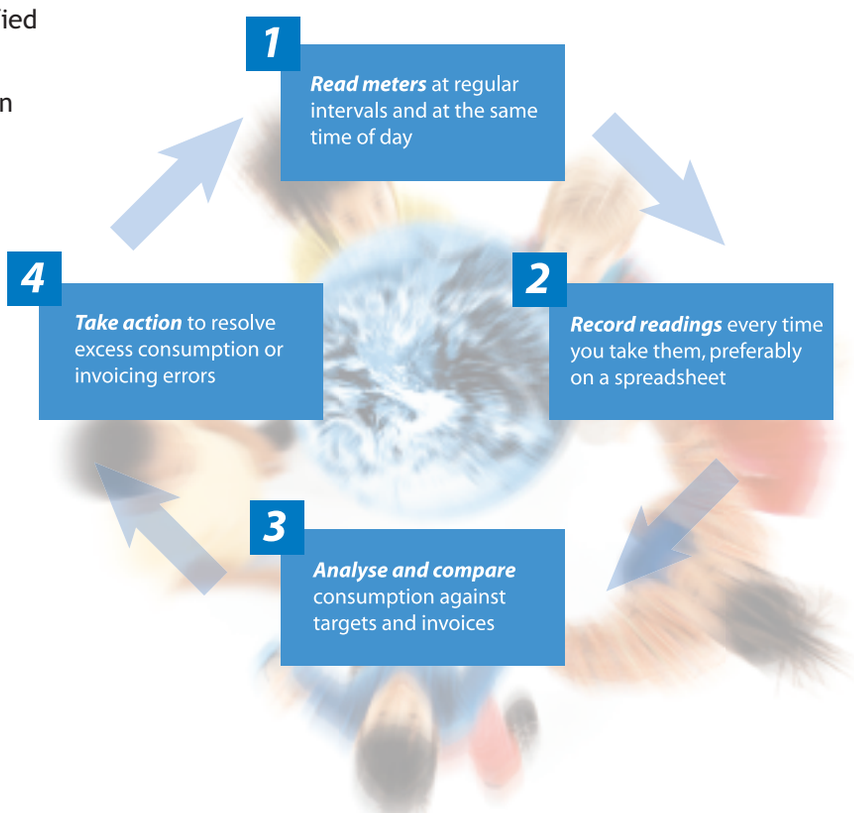
## Analysis

Having read the meters, it is important to record and analyse the data. This should be used to:

- Ensure that bills are correct
- Compare consumption against targets (where these are set)
- Plot progress. If you notice a change in consumption and it cannot easily be explained, corrective action is required.

Often it may be necessary to focus in on discrete periods of consumption (e.g. a day or a week) to gain a better understanding of your energy use and to help identify the cause of problems or wastage. Technical staff at your Local Authority can provide you with meter reading data for your site. They might be able to supply the readings on a spreadsheet, for example, so that you can analyse patterns of consumption.

***Figure 3*** *The energy monitoring process*



# Benchmarking

## Introduction

Benchmarking allows a leisure centre to compare its energy performance with other similar centres across the UK and, over time, with its own previous performance. Calculating a benchmark based on energy consumption per unit of floor area of your building allows direct comparison with other centres, giving you an idea of how energy efficient your centre is. Typical floor area compositions for different leisure facilities are shown in Figure 4. The normal units of an energy benchmark are kWh of energy used per square metre of floor area (kWh/m$^2$). During the calculation, an account of local weather conditions is also factored in as this will affect the energy consumption needed to heat a building.

This not only allows you to see how well you are doing, it also helps to identify potential savings and areas where you should focus your efforts initially. A fast and easy way to determine savings potential is to calculate the centre's performance and compare this with published benchmarks (refer to Insert 3 and ECG078 *Energy Use in Sports and Recreation Buildings* for more details).

If your centre's fossil fuel (e.g. gas or oil) benchmarks are 'typical' (the level of energy performance found in most buildings of this kind) for a facility of its type but your electricity use is much higher then you know to investigate electricity use first. The difference between your energy cost and 'good practice' (energy performance found in a well-performing centre) represents the extent of savings that are available.

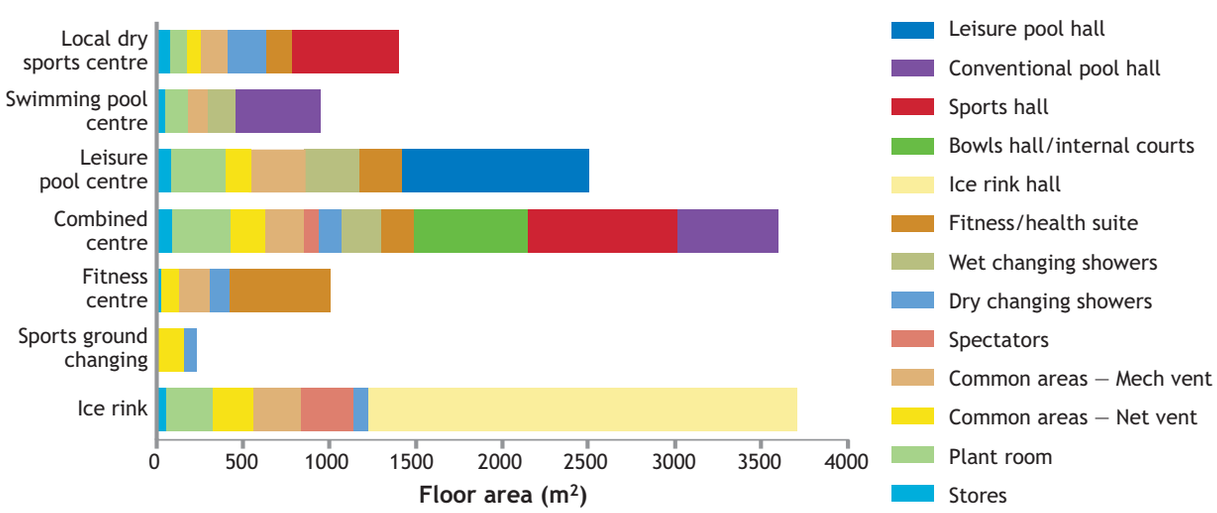
Benchmarks are not a precise tool so if you appear to be performing well, it does not mean that there are no savings possible, merely that savings are more likely to be identified through a physical survey than through analysis.

## Energy benchmarks

Benchmarks are calculated separately for fossil fuel and electricity, so you can determine performance against each benchmark for each type of energy use. It is possible that performance may be good for electricity but poor for fossil fuel or vice versa. A full explanation of benchmarking is given in ECG078 and a summary is included in Insert 2.

The range of benchmarks is helpful in determining realistic quantified potential savings. For example, a centre with a leisure pool may currently be using over 1570 kWh/m$^2$ a year in total, but it may be possible over a two year period to improve performance to somewhere between 'good' and 'typical' — perhaps to just over 1150 kWh/m$^2$ a year (see Figure 5). This would result in savings of over 420 kWh/m$^2$ a year, worth more than £6.30/m$^2$ p.a.[1]

***Figure 4*** *Typical floor area compositions of leisure facilities*




[1] The cost benchmarks are based on average unit rates (including standing and demand charges, but excluding the Climate Change Levy and VAT) of 5.5p/kWh for electricity and 1p/kWh for gas. Energy prices vary with the size of supply and are changing rapidly — if yours are significantly different, you will need to adjust the cost benchmarks.

***Figure 5*** *Energy consumption benchmarks for leisure facilities*

| Type | Good practice — fossil fuel (kWh/m²/yr) | Good practice — electricity (kWh/m²/yr) | Typical — fossil fuel (kWh/m²/yr) | Typical — electricity (kWh/m²/yr) |
|---|---|---|---|---|
| 25m Swimming pool centre | 573 | 152 | 1336 | 237 |
| Centre with leisure pool | 573 | 164 | 1321 | 258 |
| Combined centre | 264 | 96 | 598 | 152 |

Benchmarks and information on how to calculate your energy use and $CO_2$ emissions can be found online at www.thecarbontrust.co.uk. The simplest approach is to use the online benchmarking tool for sports and leisure centres located on the website. Essentially, the tool is an electronic version of ECG078. In addition, refer to Figure 5 and Insert 3 of this Guide.

Picture courtesy of Andrew Southall/Feilden Clegg Bradley Architects

# Energy walk-rounds

Effective decision-making requires relevant, up-to-date information on where and how much energy is being used. Monitoring can help identify the amount of energy that can be saved and performing a brief survey or walk-round will help to determine how it can be saved. A walk-round helps to:

- Establish current operating practices
- Eliminate wasteful practices and ensure they do not recur
- Demonstrate commitment to improving energy performance
- Identify opportunities for savings
- Involve site staff and users of the facilities.

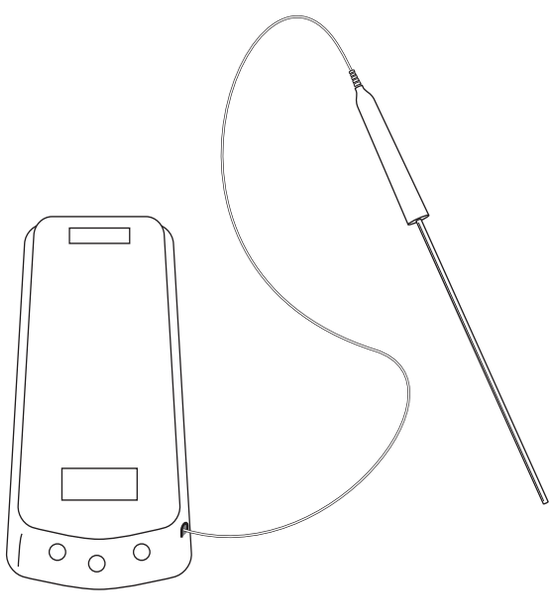
Staff at leisure centres should be able to make a visual inspection of each room and activity area in turn, noting down on checklists where:

- Energy is being wasted
- Repair or maintenance work is needed to reduce energy costs
- There is a need for capital investment to improve energy efficiency.

It cannot be emphasised enough that the monitoring of energy is a management tool but it is the response to the monitoring information that will save energy and money. As such, the benefit gained from regular inspections and maintenance checks cannot be overstated.

It is advised to invest in reliable portable temperature recording equipment to allow for the accurate checking of air and water temperatures as part of a walk-round (see Figure 6). These temperatures should be checked and documented against a schedule of preferred conditions for different spaces in the centre.

***Figure 6*** *A temperature probe helps to monitor centre conditions*



**Good housekeeping and walk-round checklists are included as Inserts 4 and 6 to this Guide.**

## Saving energy at leisure — Case Study 2

Fitting electronic equipment to assist with the control of swimming pool pump motors at Hutton Moor Pool is expected to save nearly £7,000 a year. Thanks to the expertise of energy officer, Steve Hodges at North Somerset Council, the pool in Weston-Super-Mare is benefiting from technology that has been in use for a long time in the water industry but until now only rarely in pools.

"Another first for North Somerset Council whose pool is now a national example to others in the drive to reduce energy and $CO_2$ emissions."

**Councillor Ian Peddlesden,**
North Somerset Council

# Energy awareness campaigns

All members of the community should be involved in energy efficiency by having the opportunity to:

- Report problems and suggest how energy might be used more effectively
- Find out what actions are being considered or have already been undertaken
- Find out why some actions cannot be taken
- Contribute to the formulation of policy
- Be involved in devising and implementing the action plan
- Take part in the periodic review of progress.

A central 'energy notice board' should be populated with posters, weekly energy consumption information and comparisons, progress on current projects and any other relevant information to be publicised. This should be on the public side of the centre to promote your activities to the wider community through your users and would also act as a prompt to encourage their participation too.

## Once a campaign is up and running

A 'drip-feed' strategy is better than a 'big bang' so it is important to maintain momentum through a two or three-year rolling programme of themes, such as:

- Doors and draughts in autumn
- Heating in winter
- Sensors and controls in spring
- Windows, cooling and lighting in summer
- Electrical appliances, hot water and pool covers throughout the rest of the year.

Themes can be linked to projects with a definite end-point and the contribution of all participants should be recognised and rewarded in appropriate ways.

## Involving staff and customers

Staff and customer suggestion schemes should be encouraged. Feedback on suggestions should be provided to staff both verbally and through the energy notice board.

Competitions can be a very good way of encouraging the participation of staff and customers. For example, you could ask staff to encourage their children to design posters for use in printed newsletters or promotional activity to highlight energy initiatives on a regular basis. This approach will increase the perception of energy management as a continual activity rather than a one-off initiative.

Regular feedback to staff and customers on the success of an energy campaign is also very important and energy performance and achievements should be displayed on the public notice board in the centre. This will soon become a legal requirement in public buildings anyway, so there is an advantage to starting now.

# Electrical equipment

UK leisure centres spend millions of pounds on electricity each year, which accounts for approximately 25-30% of the total energy used. Electricity is typically four to five times more expensive than gas, representing over 60% of the total energy cost. Electricity is also responsible for more than twice the carbon emissions of gas. Real electrical savings are possible in all centres and many can be achieved at no extra cost. They are often within the control of staff and service users, providing an excellent opportunity to start involving people and making savings.

## Lighting

In a dry leisure centre, lighting can account for up to 20% of total energy costs. In a wet centre, this may be up to 8%. Making changes to lighting is one of the simplest ways of both saving energy and extending the life expectancy of fittings. There are many ways to make savings:

- Improve management practices by ensuring lights are switched off when they are not required e.g. in unoccupied areas or because there is adequate daylight
- Maintain existing lights, replace any that flicker (which use more energy) and clean lamps and fittings regularly
- Ensure that 'traditional' light bulbs are replaced with energy saving compact fluorescents (CFLs) which last 8 times longer and use 70% less energy
- Ensure that 38mm diameter fluorescent lamps are replaced wherever possible by 26mm versions that use 8-10% less electricity
- Establish a clear policy on future replacement, taking technical advice on the most appropriate solution (refurbishment may not be seen as routine maintenance)
- Invest in newer, more efficient lighting during new build or refurbishment — seek guidance and technical support from technical staff in your organisation where appropriate
- Make sure lighting is appropriate for the application (i.e. can interface with natural daylight, provide variable lighting levels in response to activity and support appropriate control in areas of intermittent use).

## Energy use in health suites and gymnasia

Customer demand for gymnasia has increased electrical consumption from fitness equipment that is often provided in separate air-conditioned areas. There are a number of ways to minimise energy consumption in these areas whilst still maintaining the same level of service:

- Match demand to supply so that at quieter times of day, some machines are switched off
- Allow room temperatures to rise to the maximum level consistent with comfort; keep access doors and windows shut if air conditioning is on
- Maintain ventilation equipment and air-conditioning systems by ensuring regular servicing; keep moving parts and air pathways clear of dust and blockages
- When installing or refurbishing air-conditioning equipment, ensure that recycle dampers are closed in cooler months and supply air is drawn from outside. This makes the most of any free cooling available and minimises the amount of energy required to keep the area at the required temperature
- Purchase the most efficient exercise equipment available — the more energy required to run your apparatus, the more heat is emitted and the higher the energy costs. This will in turn increase the cost of cooling the area too! Where possible, specify equipment that is powered by human activity
- Switch exercise equipment and cooling systems off overnight
- Turn off heating in saunas and steam rooms when not in use, as the electric heating in these facilities is expensive to run

Did you know that the cost of rewinding motors can be high compared with the cost of a new motor? Unless the motor is rewound to high standards, the efficiency can be reduced from between 0.5 - 2% or more. Therefore, the decision to rewind or to replace with a new high efficiency motor should be based on lifetime costs. See Figure 7 for more information.

- Consider using a cover to minimise heating costs in spa baths. Install a timer to benefit from night rate electricity to preheat the bath and remember to switch off the spa when not in use to cut costs.

## Motive loads

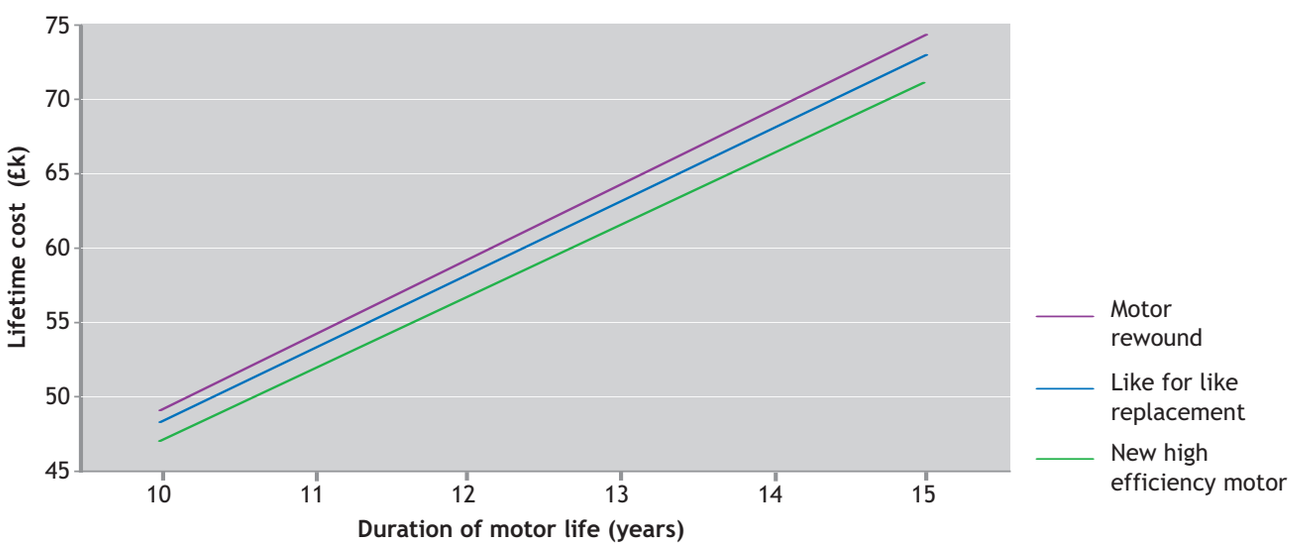
Electrical energy consumption of motors in fans, pumps and pool water systems is considerable. For example, a typical 11kW induction motor in a pool circulation pump, costing £300 to buy, could build up a running cost of up to £30,000 from continuous operation over its lifetime[2]. Thus it is important to ensure good housekeeping and correct maintenance with these systems:

- Ensure that motors, fans and pumps are switched off where possible
- Use the automatic controls of fans and pumps to reduce running costs
- Install dual speed or variable speed drives (VSDs) to cut energy costs.

High efficiency motors should always be considered as they often have no additional capital cost and they offer efficiency and economic benefits in virtually all situations.

By purchasing a high efficiency motor instead of having the motor rewound, you could save more than £3,350 for a motor life of 15 years.

***Figure 7*** *Lifetime costs for the replacement of a 11kW pool pump induction motor*




[2] Section 11.0 CIBSE Guide F — *Energy efficiency in buildings*

# Hot and cold water

There are three main areas where domestic hot and cold water are used in leisure centres:

- Changing areas and toilets
- Catering facilities
- Cleaning.

The efficient delivery of water to the point of use, coupled with the efficient use of water, will result in savings of both energy and water.

## Water saving measures

The number of centre users largely determines how much water is used in toilet and changing areas so, to minimise water consumption, controls should be automated wherever possible. Figure 8 shows a number of measures that could help staff to save water.

There are further opportunities for saving water and energy in each of the areas shown in the checklist. These are explained in Figure 9.

***Figure 8*** *Water-saving measures*

| Measure | Comments | Annual saving | Payback (years) |
|---|---|---|---|
| Tap restrictors | Valuable for providing equal flow at a number of taps in a wash room | Typically reduces water flow by 15% | 1 |
| Push taps | Ideal for public areas where taps may be left running | For a tap dripping at 3.5l/h, this measures saves 31m$^3$ of water p.a. | 1 |
| Shower regulators | Valuable for providing equal flow at a number of outlets | Typically reduces water flow in showers by 20% | 1 |
| Push-button showers | Ideal for public areas where showers may be left running | Typically saves 5-15% per shower depending on the location | 1 |
| Urinal flush controls | Several systems are available from different manufacturers | Typical savings of 10% per toilet | <1 |
| Toilet water dams | Adequate flushing needs to be ensured to maintain hygiene standards | Typical savings of 20% per toilet | <1 |

***Figure 9*** *Checklist for further savings of water and energy*

| Opportunity | Reason | Action |
|---|---|---|
| **Catering facilities** | | |
| Are staff aware of water costs? | Raising staff awareness will help to promote more efficient use | Use promotional materials to raise awareness |
| Are staff aware of the importance of preventing water wastage by simple actions such as turning off taps? | Taps that are not properly turned off waste water. Dripping hot taps waste energy too | Initiate a good housekeeping campaign to encourage staff to turn off taps. This information will also be of value to staff who have metered water at home |
| Are staff aware of the importance of using dishwashers efficiently? | Dishwashers used at only part load waste both energy and water | Instigate practices under the good housekeeping campaign to ensure that staff use machines at full load |
| **Cleaning** | | |
| Have you checked whether hot water is used unnecessarily? | Hot water is more expensive to produce than cold water and is sometimes used where cold water would be equally effective, (e.g. to hose down floors or for rinsing) | Check the different ways that hot water is used your centre and make sure that cold water is used for cleaning purposes (unless hot water is essential) |
| Are all hoses turned off immediately after use? | Hoses that are left on waste a great deal of water | Fit spring-loaded pistol grips to provide automatic cut-off |

Picture courtesy of Mandy Reynolds/Feilden Clegg Bradley Architects

# Swimming pools

If your facility has a swimming or leisure pool, it is likely to be a major energy user. Up to 65% of energy is consumed by pool heating and pool hall ventilation so these areas offer excellent opportunities for energy saving.

Energy is used in the pool area in a number of ways. Each one should be considered when looking to reduce energy consumption, including:

- Loss of heat from pool water through evaporation (and to a lesser extent, convection at the surface)
- High pool hall air temperatures — typically 28-30 °C to maintain comfort for guests and reduce risk of condensation from humid air
- High extraction/ventilation levels (around 4-10 air changes an hour) to remove excess humidity from pool evaporation. High ventilation rates require high levels of fresh make-up air to replace extracted air. All incoming fresh air has to be heated up
- Continual pumping of pool water through the filters
- Pool filter backwashing.

Using the appropriate interval between consecutive backwashes of a pool filter will cut down on energy and water consumption. The interval will depend on the type of pool and the degree of usage. Often cyclic (e.g. weekly) backwashes are recommended, but some manufacturers prefer that the pressure drop across a filter is used as an indicator of when a backwash is required. Always consult the manufacturers of your pool equipment if you are considering changing the maintenance regime. Further information on this topic can be found in HSE guidelines (referenced at the back of this Guide) or at www.spata.co.uk

Ensure that staff are aware of optimum operating temperatures for the pool hall as 'too cold' can cause as many problems as 'too hot' in these areas.

Did you know that installing a pool cover can cut total pool energy use by between 10-30% by reducing heat loss and ventilation requirements?

The purpose of a pool cover is to reduce convective and evaporative heat losses from the pool. This allows pool hall ventilation to be reduced without a resulting rise in relative humidity and it means that the overall temperature of the pool hall may be decreased overnight without adversely affecting the water temperature. Typical savings for the installation can be 10-30% of total pool energy use with a payback period of 18 months to 3 years. Manual, semi-automatic or automatic covers are available in a variety of shapes to fit most pools — although there are limitations. Ideally, the entire pool surface should be completely covered, but any significant reduction in exposed water surface area will result in savings. Don't forget to put a cover on your spa bath too.

Case studies have shown that where a full cover is fitted, ventilation plant has been shut down completely at night without condensation problems occurring. A humidistat within the pool hall will ensure that the ventilation system is switched on only if relative humidity within the hall rises above 65-70%.

***Figure 10*** *Maximum recommended pool water temperatures*

| Pool type | Temp (°C) |
|---|---|
| Training and competition | 25-27 |
| Conventional | 28 |
| Diving | 28 |
| Leisure | 29 |
| Teaching | 29 |
| Hydrotherapy | 32-40 |
| Spa | 40 |

## Money can also be saved by:

- Ensuring that water temperature is maintained at the minimum level to meet comfort conditions. Temperatures should range from 25-27ºC for competition pools to 40ºC for a spa pool. Refer to Figure 10 for further details
- Ensuring that the pool hall air temperature is controlled correctly. This should be maintained at 1ºC above the water temperature to limit evaporation from the pool surface
- Limiting expenditure on pool make-up water by only backwashing filters when necessary. Backwashing is very costly in both water and energy terms.

***Figure 11*** *Recommended space temeratures*

| Space type | Temp (°C) |
|---|---|
| Multi-purpose | 12-18 for sports activities and 18-21 for sedentary activities |
| Pool hall | Air temperature 1ºC above water temperature |
| Fitness centre | 16-18 |
| Weight training | 12-14 |
| Squash courts | 16-18 for courts and 18 for spectators |
| Ancillary halls | 15 for sports and 21 for non-sports |
| Changing areas | 20-25 |
| Reception, offices and circulation | 16-20 |
| Crêche | 21 |
| Refreshment and bar areas | 18 |

### Saving energy at leisure — Case Study 3

Installing a semi-automatic pool cover at the Eastern Leisure Centre in Cardiff saved 22% of the centre's energy consumption and 15% of its costs. Once installed, the cover saved over £9,000 per year and paid for itself in 1.6 years. For further information, refer to GPCS076 *Energy efficiency in sports and recreation buildings.*

"Eastern Leisure Centre still has the lowest energy use per square metre out of all Cardiff's leisure centres ten years on. Following this success, pool covers were fitted at 3 other Cardiff leisure centres and we are now looking at fitting pool covers at 2 leisure pools and in school swimming pools."

**David Mundow**
Energy Manager, Cardiff County Council

# Acknowledgements

We would like to thank the following contributors for their assistance in the production of this Good Practice Guide:

David Mundow, Energy Manager, Cardiff County Council

Peter Laing, Technical Consultant, The Swimming Pool & Allied Trades Association (SPATA)

Barry McKean, Energy Manager, Knowsley Metropolitan Borough Council

Steve Hodges, Energy Officer, North Somerset Council

Fliss Mills, Feilden Clegg Bradley Architects.

## References and sources of further information

ECG078 *Energy use in sports and recreation buildings*

GPG137 *Energy efficiency in sports and recreation buildings: effective plant maintenance*

GPG144 *Energy efficiency in sports and recreation buildings: technology overview*

GPG167 *Organisational aspects of energy management: a self-assessment manual for managers*

GPG211 *Drawing a winner: energy efficient design of sports centres*

GPG223 *Cost-effective lighting for sports facilities: a guide for centre managers and operators*

GPG228 *Water-related energy savings: a guide for owners and managers of sports and leisure facilities*

GPCS076 *Energy efficiency in sports and recreation buildings: swimming pool covers*

Sports and Leisure online benchmarking tool: available at **www.thecarbontrust.co.uk**

HSG179: *Managing health and safety in swimming pools: available at **www.hsebooks.com***

CIBSE Guide F — *Energy efficiency in buildings: available at **www.cibse.org***

CIBSE Guide G — *Public health engineering: available at **www.cibse.org**.*

Further publications and information are available through the organisations listed on the 'Key Organisations' insert. (Insert 1)

Tel 0800 58 57 94

www.thecarbontrust.co.uk/energy

An independent company set up by the Government to help the UK meet its climate change obligations through business-focused solutions to carbon emission reduction, the Carbon Trust is grant funded by the Department for Environment, Food and Rural Affairs, the Scottish Executive, Welsh Assembly Government and Invest Northern Ireland.

The Carbon Trust works with business and the public sector to cut carbon emissions and capture the commercial potential of low carbon technologies.



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8th Floor, 3 Clement's Inn, London WC2A 2AZ

Printed on paper containing a minimum of 75% de-inked post-consumer waste.

Published in the UK: April 2005.



Ref: GPG390

# Key organisations

**ILAM (Institute of Leisure and Amenity Management)**
ILAM House
Lower Basildon
Reading
RG8 9NE

Tel: 01491 874800
Fax: 01491 874801
Internet: www.ilam.co.uk
E-mail: info@ilam.co.uk

**ISRM (Institute of Sport and Recreation Management)**
Sir John Beckwith Centre for Sport
Loughborough University
Loughborough
Leicestershire
LE11 3TU

Tel: 01509 226474
Fax: 01509 226475
Internet: www.isrm.co.uk
E-mail: info@isrm.co.uk

**Sport England**
3rd Floor Victoria House
Bloomsbury Square
London
WC1B 4SE

Tel: 08458 508508
Fax: 020 7383 5740
Internet: www.sportengland.org
E-mail: info@sportengland.org

**The Swimming Pool and Allied Trades Association (SPATA)**
1a Junction Road
Andover
Hampshire
SP10 3QT

Tel: 01264 356210
Fax: 01264 332628/337330
E-mail: admin@spata.co.uk

**Sports Council for Wales**
Sophia Gardens
Cardiff
CF11 9SW

Tel: 029 2030 0500
Fax: 029 2030 0600
Internet: www.sports-council-wales.co.uk
E-mail: publicity@scw.co.uk

**Cyngor Chwaraeon Cymru**
Gerddi Sophia
Caerdydd
CF11 9SW

Ffôn: 029 2030 0500
Ffacs: 029 2030 0600
Rhyngrwyd: www.sports-council-wales.co.uk
E-bost: publicity@scw.co.uk

**Sport Scotland**
Caledonia House
South Gyle
Edinburgh
EH12 9DQ

Tel: 0131 317 7200
Fax: 0131 317 7202
Internet: www.sportscotland.org.uk
E-mail: library@sportscotland.org.uk

**Sports Council for Northern Ireland**
House of Sport
Upper Malone Road
Belfast
BT9 5LA

Tel: 028 90 381222
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Internet: www.sportni.net
E-mail: info@sportni.net

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## Technical support from the Carbon Trust

The Carbon Trust aims to achieve environmental and economic benefits by promoting cost-effective energy efficiency measures in industry, commerce and public sectors.

To find out further information on a range of free services specifically provided for sports and leisure facilities, contact the Carbon Trust Energy Helpline on **0800 58 57 94** or visit the website at **www.thecarbontrust.co.uk**

Services include:

- Free publications including consumption benchmarks, technical information, awareness/publicity material and case studies
- Events — free expert speakers and information packs can be provided for organisations (e.g. Local Authorities) that wish to run energy saving seminars for staff
- Free energy surveys for larger sites.

## Contact us

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Northern Ireland Science Park
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BT3 9DT

Tel: 02890 737912
Email: geoff.smyth@thecarbontrust.co.uk

# Sample energy policy for Leisuretown Sports and Fitness Club

## Stop energy wastage, save money and help the environment

### Main objectives

1. Use centre energy and water resources as efficiently as possible to save money and help the environment.
2. Increase staff awareness of energy efficiency.
3. Maintain an energy campaign in the centre to let customers know how they can help to save energy.
4. Set targets, regularly monitor and evaluate energy performance levels.
5. Reduce the amount of pollution, particularly carbon emissions caused by energy consumption.
6. Purchase energy and water at the most economic price and consider using energy from renewable resources.
7. Be aware of the environment and take energy saving outside of the centre too.
8. Accurately identify patterns of energy use throughout the centre in order to target areas of high consumption.
9. Invest in a programme of energy saving measures which will maximise return.
10. Keep abreast of new energy efficiency technologies and processes and incorporate them into any centre refurbishment and maintenance plans.

It is suggested that a policy like this should be displayed in one of the public areas on your site — for example on an energy awareness notice board.

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# Sample energy performance certificate

## Policy statement

| |
|---|
| |

Leisure Centre is committed to the responsible management of energy and water.

By efficient management of these resources, we aim to:

- Minimise expenditure and environmental impact
- Maintain health and safety standards
- Maintain an acceptable comfort level for staff, customers and all other building users.

## Targets

Our target energy and water performance is:

| | Current performance 2005/06 | Target performance 2006/07 | % Target reduction |
|---|---|---|---|
| **Electricity** kWh/$m^2$/annum | | | |
| **Gas** kWh/$m^2$/annum | | | |
| **Oil** kWh/$m^2$/annum | | | |
| **LPG** kWh/$m^2$/annum | | | |
| **Solid fuel** kWh/$m^2$/annum | | | |
| **Water** $m^3$/visitor/annum | | | |

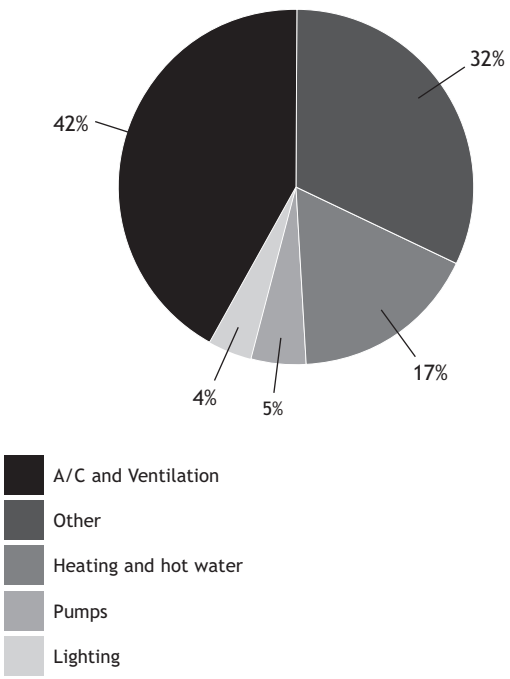
# Energy consumption, costs and benchmarks for leisure centres*

In most leisure centres, energy is supplied in two forms: fossil fuel (gas, oil, coal or LPG) and electricity. Some centres only have access to electricity or use it more extensively, e.g. for space heating and ventilation. However, for the majority of sites, space heating and hot water is supplied by fossil fuel. Electricity use is for lighting, electrical equipment, fans and pumps.

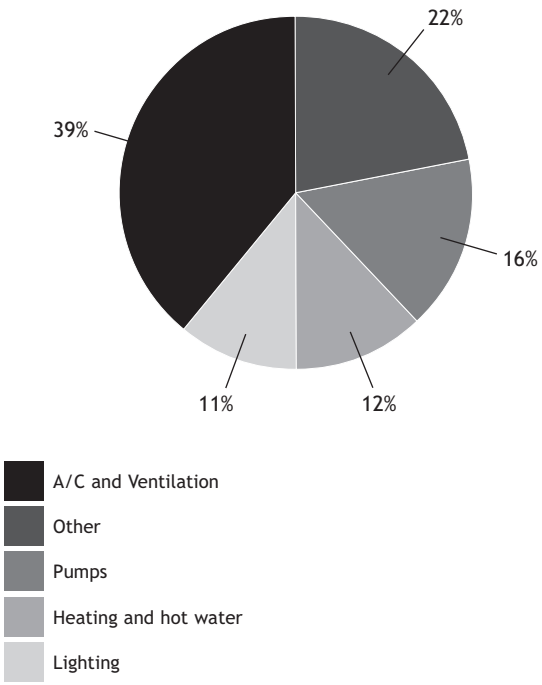
Electricity is an important element to control and as much electricity usage is within the control of end users, it should take first priority in reducing costs.

The pie charts below show the energy consumption and cost breakdown for a typical leisure centre.

*Energy use for a typical leisure centre with a pool*




*Energy costs for a typical leisure centre with a pool*




*Refer to ECG078 *Energy use in sports and recreation buildings*

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The benchmarks are similar to those used in measuring energy consumption in a car (e.g. miles per gallon). In leisure centres, the benchmark is measured in kilo-watt hour (kWh) per $m^2$ of heated floor space per annum for fossil fuel and electricity. Energy consumption benchmarks for each type of pool building are shown below. Please note that these figures are for the whole pool building and not only the pool area. The typical value is the median value of the data. This is the value for which 50% of data points will be higher and 50% lower.

*Energy consumption benchmarks for leisure facilities*

| Type | Good practice — fossil fuel (kWh/$m^2$/yr) | Good practice — electricity (kWh/$m^2$/yr) | Typical — fossil fuel (kWh/$m^2$/yr) | Typical — electricity (kWh/$m^2$/yr) |
|---|---|---|---|---|
| 25m Swimming pool centre | 573 | 152 | 1336 | 237 |
| Centre with leisure pool | 573 | 164 | 1321 | 258 |
| Combined centre | 264 | 96 | 598 | 152 |

*Cost benchmarks for leisure facilities*

| Type | Good practice — fossil fuel (£/$m^2$/yr) | Good practice — electricity (£/$m^2$/yr) | Typical — fossil fuel (£/$m^2$/yr) | Typical — electricity (£/$m^2$/yr) |
|---|---|---|---|---|
| 25m Swimming pool centre | 5.73 | 8.36 | 13.36 | 13.04 |
| Centre with leisure pool | 5.73 | 9.02 | 13.21 | 14.19 |
| Combined centre | 2.64 | 5.28 | 5.98 | 8.36 |

*$CO_2$ emission for different fuel types*

| $CO_2$ emissions by fuel type for the UK | | | |
|---|---|---|---|
| | England, Scotland and Wales kg $CO_2$/kWh | kg $CO_2$/litre | Northern Ireland kg $CO_2$/kWh |
| Electricity | 0.52 | - | 0.72 |
| Natural Gas | 0.19 | - | 0.19 |
| Gas/Diesel Oil | 0.25 | 2.68 | 0.283 |
| Liquid Petroleum Gas (LPG) | 0.23 | 1.65 | 0.236 |
| Renewables | 0 | 0 | 0 |

To calculate your centre's carbon dioxide emissions, multiply your consumption (in kWh) by the $CO_2$ factor (see below)

*Example summary of $CO_2$ emissions*

| Fuel | Annual kWh | | $CO_2$ factor | | Annual kg $CO_2$ |
|---|---|---|---|---|---|
| Natural gas | 1,134,000 | X | 0.19 | = | 215,460 |
| Electricity | 266,000 | X | 0.52 | = | 138,320 |
| Total | 1,400,000 | | | | 353,780 |

# Good housekeeping checklist

## Tips for heating

- Set the thermostat at 19ºC in public spaces — this should be higher for wet areas. Don't forget energy costs rise by 8% for every 1ºC increase in temperature
- Storerooms, corridors and areas where there is heavy physical activity can be set to lower temperatures, say 16ºC
- Don't block radiators with furniture — it reduces efficiency and output
- Keep external doors and windows closed, particularly in cold weather
- Make sure that in air-conditioned areas, heating and cooling systems are not operating simultaneously as this wastes a great deal of energy
- Keep internal doors closed where they are between spaces of differing temperatures. If staff are too warm, turn the heating down instead of opening doors or windows.

## Tips for lighting and electrical equipment

- Turn off lights in empty rooms and corridors, especially at the end of the day. This can save up to 15% of your lighting bill
- Lights too bright in corridors? Switch off alternate fittings
- Use daylight where possible. It's free — so keep windows and skylights clean and clear
- Saunas, steam rooms and spas are very energy intensive so switch off heaters and pumps when not in use
- Switch off air-conditioning plant and apparatus in fitness suites when not in use.

## Tips for energy management

- Check that consumption of electricity, gas and oil matches your bills
- Compare your energy and water use with other centres in your organisation
- Investigate any increase in energy consumption that is unaccounted for
- Ask your colleagues for ideas on saving energy and where they think energy is being wasted
- Encourage staff to turn off taps — this information will also be of value to staff who have metered water at home
- Check the different ways that hot water is used at your centre and use cold water for cleaning purposes wherever possible
- Make sure that hoses used to rinse poolside areas are fully turned off after use
- Carry out regular good housekeeping measures
- Note down any remedial or maintenance requirements and make sure these are carried out.

## Tips for the pool hall

- Keep doors closed between areas with different temperatures and humidity
- Check that pool covers are used at the end of the session — this also applies to spa baths
- Conduct regular pool backwashing and clean the pool filters to maintain good quality clean water
- Keep the introduction of fresh pool water to a sensible minimum, consistent with maintaining water quality
- Regularly check air and water temperatures and keep the air temperature close to, but above, the pool water temperature
- Keep the relative humidity in the pool hall between 55-65%
- Staff should know how the plant and control systems operate — introduce additional training if necessary
- Keep a record of standard control settings for different pool occupancy profiles — make sure that staff can access and use these settings
- Regularly calibrate technical equipment such as swimming pool probes as their performance could affect the energy consumption of the site.

# Energy management matrix for leisure facilities

The energy management matrix provides an effective way to gain insight into a leisure centre's current approach to energy management. Used regularly, it can identify important activities to improve the energy efficiency of your centre.

Each column of the matrix deals with one of six crucial energy management issues: energy policy, organising, staff motivation, information systems, marketing and investment. The rows 0 to 4 represent a centre's increasing command of these issues.

The aim is to have a balanced (flat) profile at the top of the chart but chances are, your organisation's profile is uneven and nearer the bottom. Implementing good energy management practices will help you to progress up the chart in a balanced manner.

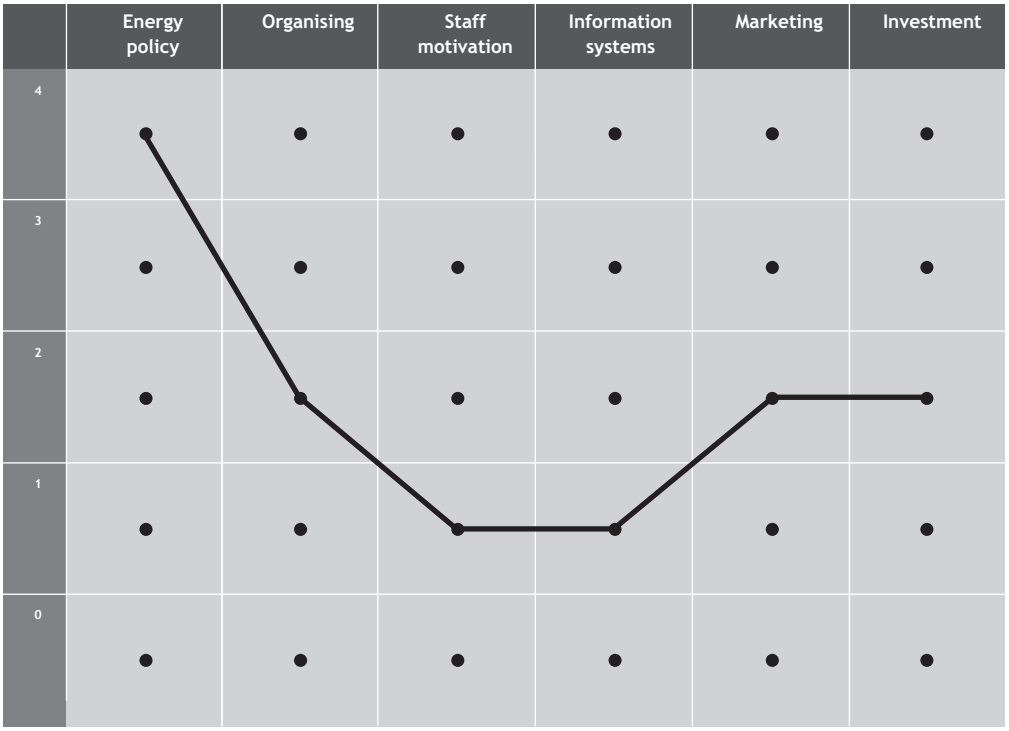
Refer to **GPG167** *Organisational aspects of energy management: a self-assessment manual for managers* if you require more detailed information on energy management matrices.

*The energy management matrix for leisure facilities*

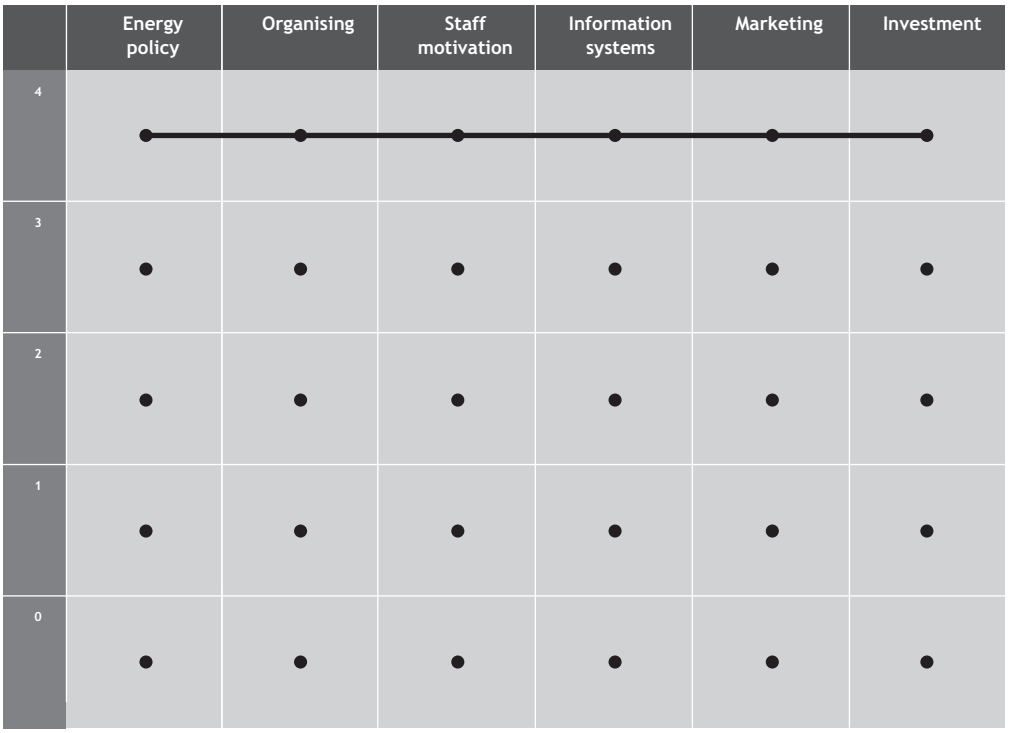
| Level | Energy policy | Organising | Staff motivation | Information systems | Marketing | Investment |
|---|---|---|---|---|---|---|
| 4 | Active commitment of leisure centre senior management | Fully integrated into general centre management | All staff accept responsibility for saving energy within the centre | Comprehensive system with effective management reporting in the centre | Extensive marketing within and outside the organisation | Positive discrimination in favour of 'green' schemes at the centre |
| 3 | Formal policy in place but with no centre management commitment | Clear delegation and accountability amongst centre staff | Most major users motivated to save energy | Monthly monitoring and targeting for individual premises within the sports complex | Regular publicity campaigns for staff and customers | Same appraisal criteria as for all other investments |
| 2 | Centre has an unadopted energy policy | Delegation but line management and authority unclear | Motivation patchy or sporadic | Monthly monitoring and targeting by fuel type | Some ad-hoc staff awareness training at the centre | Investment with short term payback only |
| 1 | Centre has an unwritten set of energy guidelines | Informal part-time responsibility for member of centre staff | Some staff awareness of the importance of energy saving within the centre | Periodic invoice checking and validation by centre staff members | Informal contacts used to promote energy efficiency in the centre | Only no or low cost measures taken up |
| 0 | No explicit energy policy for the centre | No delegation of energy management at the centre | No awareness of the need to save energy at all | No information system or accounting for consumption at all | No marketing or promotion | No investment in energy efficiency |

# Example energy management matrices

*A typical organisation profile*




*An exemplary organisation profile*



# Blank energy management matrix

Photocopy this blank matrix and use it to profile your centre

| | Energy policy | Organising | Staff motivation | Information systems | Marketing | Investment |
|---|---|---|---|---|---|---|
| 4 | ● | ● | ● | ● | ● | ● |
| 3 | ● | ● | ● | ● | ● | ● |
| 2 | ● | ● | ● | ● | ● | ● |
| 1 | ● | ● | ● | ● | ● | ● |
| 0 | ● | ● | ● | ● | ● | ● |

# Walk-round checklists

| Date of good housekeeping inspection: | Make a schedule of spaces within your facility and note items that need attention | | |
|---|---|---|---|
| | Complete | Next due | Action/comment |
| **Action required when a space is occupied** | | | |
| Measure space and water temperatures regularly and document these against a schedule of preferred conditions for different areas | | | |
| Check for complaints about comfort conditions and report any over/under heating issues | | | |
| Check that heating controls/room thermostats are correctly set | | | |
| Switch off lights if there is sufficient daylight | | | |
| Close windows and doors in heated areas | | | |
| Avoid obstruction in front of radiators and air ducts | | | |
| **Action required when leaving empty spaces** | | | |
| Switch off lights where it is safe to do so | | | |
| Close windows and doors and at closing time, any fitted curtains or blinds | | | |
| **Pool areas** | | | |
| Check pool covers are used at the end of the day | | | |
| Check the pool hall air temperature is 1°C above the water temperature | | | |
| Check spa pools are covered and sauna and steam rooms are off | | | |
| Check that hoses used to rinse poolside areas are fully turned off | | | |
| **Fitness rooms** | | | |
| Ensure air conditioning is switched off at the end of the day. Turn on as late as possible to meet comfort conditions | | | |
| Turn off all equipment over night | | | |
| **Changing rooms, toilet areas and external lighting** | | | |
| Check hot water temperatures | | | |
| Turn off fans and lights at the end of the day | | | |
| Turn off unused taps or showers at regular intervals | | | |
| Check external lighting is off during the day | | | |
| Use floodlights only when there are customers using the facilities | | | |

| Date of maintenance inspection: | Make a schedule of spaces within your facility and note items that need attention | | |
|---|---|---|---|
| | Complete | Next due | Action/comment |
| Check location and operation of thermostatic controls | | | |
| Clean filters and grills associated with heating, air conditioning and ventilation systems at intervals recommended by the supplier | | | |
| Ensure filters, grilles and louvres are maintained in a clean condition for all ventilation and comfort cooling plant | | | |
| Check for draughts and damage to windows, window frames and doors. Repair any damage and install or maintain draught seals | | | |
| Clean windows and roof lights regularly and use daylight where practical | | | |
| Clean lights and their fittings regularly. Replace any failed or failing lights, preferably with more efficient options, e.g. slim-line fluorescents | | | |
| Check insulation levels and top up or replace where necessary | | | |
| **Boiler / plant room** | | | |
| Service boilers regularly and ensure efficiency tests are made each time | | | |
| Check control settings (thermostatic and time) | | | |
| Ensure areas of seasonal heating demand are fully isolated from areas of year round heating demand when served from a central boiler plant | | | |
| **Pool areas** | | | |
| Check swimming pool covers and associated equipment for wear and tear. Repair or replace if required | | | |
| Check temperature and humidity controls are set and operating correctly | | | |
| Check for signs of damage to walls, fixtures and fittings including damp/mould growth and metal corrosion. Adjust humidistat settings accordingly | | | |
| Where heat recovery is installed, check exhaust and inlet air temperatures to confirm acceptable standards of efficiency are being achieved | | | |
| **Changing rooms and toilet areas** | | | |
| Repair dripping taps/showers or pipework | | | |
| Install water saving devices to taps, showers and toilet cisterns/urinals | | | |
| Where zone controls are installed, ensure time schedules reflect hours of occupancy and that they function correctly | | | |
| Install automatic controls to lights and ventilation systems in toilets and changing rooms | | | |